

DM3107 Major Research Project

How can we develop and produce a device that streamlines and simplifies the process of learning music theory?

Abstract

The project investigates the development of a device designed to streamline and simplify the process of learning music theory, with a focus on guitar, aligning with Sustainable Development Goal 4 (SDG 4) to ensure inclusive and equitable quality education. The project's motivation stems from personal challenges in engaging with traditional music theory education methods, aiming to create an interactive and effective learning tool.

The methodology encompasses both primary and secondary research, including surveys and interviews with diverse learner groups, as well as analysis of existing educational tools. The research highlights the potential benefits of incorporating gamification and colour association to enhance engagement and learning outcomes. Initial findings suggest a demand for more accessible and enjoyable music theory education tools, particularly among those who have struggled with traditional methods.

The project aims to produce a concept design that is both innovative and marketable, supported by comprehensive research and iterative user feedback. The ultimate goal is to foster a more engaging and effective learning experience, thereby contributing to a broader effort in achieving educational equity and quality as outlined in SDG 4. Through this endeavour, the project seeks to inspire and facilitate a deeper passion for music among learners, ultimately reducing the dropout rate and promoting sustained musical engagement.

Introduction

The topic of my project (How can we develop and produce a device that streamlines and simplifies the process of learning music theory?) is about education and teaching which links with SDG 4 (sustainable development goal <https://sdgs.un.org/goals/goal4>).

The purpose of this development goal is to create equal opportunities in quality education for all. This subject is of interest to me as I am someone who's struggled to fully engage and find a learning method that works for me within learning music theory. I believe this project will succeed as because it's a passion of mine so I am personally interested in the subject and someone like me would also be the main target market.

I will approach the task of carrying out research by both doing primary and secondary research. The primary research I will do is create a few different questionnaires, one for people who know music theory, one for people who don't, and one for people who are currently trying to learn. Also as someone who has a brief understanding of the topic I will also be using different methods to better my understanding such as, watching YouTube guides, using free trials with existing apps and reading books on the topic.

This research page will dive into the psychology of learning and how it can be implemented into

my designs and my learning process therefore helping me achieve a more effective result and a better process.

With this project I plan to add a gamification side to it so help keep people entertained and focused to keep learning, as there is a fine line between learning because you have to and learning because you want to, therefore if I can make my product fun and make people want to use it, it'll have a better chance to succeed.

Aim

Thought out this project the aim will be to produce a concept design for a method of interactive learning of music theory specifically guitar, backed up by research, both primary and secondary.

Objectives

- 1). To produce a final design for a product that could potentially go to production and be marketed and sold, my product will also be compared and analysed against similar and existing products and methods already existing on the market to conclude if my product is better or even profitable over a competitor. I plan to measure this by having people who both know music theory and don't know and or are learning to test out my product and give feedback based on their experience. I think this goal is achievable I'm my 9-week time frame, I will defiantly be busy, but my workload isn't unachievable.
- 2). My research will also involve research into production methods and materials to make the product as cheap and accessible to as many people as possible with aligns with SDG 4 as it will hopefully reduce the rich poor divide between access to quality education. I believe this objective is relevant as this helps my project align with SDG goals, I believe that I have the skills to carry out this project to a decent level however for the future development of this project I may need to delegate some of the tasks such as making the app to a developer, if I were to take it to production.
- 3). The final objective of my project is to have a fully fleshed-out business plan so I could potentially apply for funding and or a partnership with another company. This would be helping to get my idea off the ground and better the quality as I would be able to do more research and create my prototypes and expand my business's reach. This goal would be measured by whether I have a professional business presentation ready to be presented to a board of investors or partners.

Literature review

In the pursuit of creating a device that streamlines and simplifies the process of learning music theory, it is essential that I first understand the existing use of educational tools and technologies. This review will explore various innovations in music education, examining their

effectiveness, accessibility, and user experience. By analysing these existing tools, I can identify key features and methodologies that contribute to a more intuitive learning process.

Gorbunova (2020) argues that technology within music provides great opportunity for both students and teachers in the sense that technology allows access for interaction with virtual instruments. The ability to use technology to create music is highly impactful as using something such as a tablet smart computer can give access to instruments such as drums, keyboard and many more with the use of apps. The technology is becoming more accessible to everyone as a result of also becoming more affordable Gorbunova (2020). Crawford (2013) also agrees that the blend of technology with music is leading to success as the platform provided by technology allows creativity and collaboration within a virtual space. By building a sense of community strengthens the motivation shown by a study by Okayama (2011) why studying the effects of community-based learning in healthcare. The same concept can be applied to the current project as community-based learning has been proven to be more effective, it'd be beneficial to build a sense of community within the project to increase the levels of the users' motivation, hence it's a feature to look into developing. In the past the privilege of having quality music education has been for people who are willing to spend a high amount of money on courses and or lessons in person however Gorbunova (2020) agrees that technology is allowing more people to experience the quality education that in the past only those with the funds could, as he states that persons whom can afford to experience education in order to learn how to decipher notes and read sheet music, but technology is now bridging the gap, Crawford (2013) also agrees technology enhances the musical education experience. Gorbunova (2018) states that technology has great potential for enhancing the writing, performing and research of music as technology provides limitless opportunities with global accessibility for development in knowledge.

In an article published by Kämpfen (2018) it states that technology is at the heart of improving quality of life and stated by Atkinson & Castro (2008) that the world had been greatly benefited by the implementation of technology, this led to the growth in many sectors such as healthcare, education and government. The increase in education is important to highlight as this project is trying to implement technology with music in order to improve the educational process and make it more accessible and effective. Atkinson & Castro (2008) were also saying that the increase of technological implementation has led to the development of income growth, innovation and higher quality products and services as well as greater productivity. On top of this they also found that technology and the global phenomenon of the internet led to the birth of hundreds of millions of jobs around the IT industry. And they also state that the best is yet to come from the world of technology. Kämpfen (2018) found that in their research that commonly children find it easier to use technology than the older generation due to the children growing up using the technology, which creates a generational and technological divide and the exclusion of the older generation in the up-and-coming world. Using this information highlights the importance of implementing technology in education and how it's essential that children have the basic skills to operate the common everyday technology, as Barlex (2015) agrees that technology is essential to growing a valuable society and develop economic success. They also say that it's important to have standardized tests in order to have a way to measure knowledge within the educational system. It's important to have a standardized system when developing the project or else how can success be measured. The idea of having a gamification topic implemented is an attractive idea as gamification techniques have already been adopted by the

education system and have been shown to have success Caponetto (2014). The idea of having a gamification system such as point scoring, levelling up or achievements aligns with the study conducted by Deci & Vallerand & Pelletier & Ryan (1991) which gives the idea that for students to be actively engaged in education they must value their learning & achievements & their accomplishments. Miodufer (2015) says that knowledge is gradually constructed by meaningful interactions between existing knowledge & intellect and experiencing new challenges. The meaning being that each person is shaped by a series of unique experiences and events therefore this would mean that everyone is different and everyone knowledge is at different levels resulting in people having strengths and weaknesses. It's important to consider this in the development of the product as it needs to cater to the wide scope of users in order to be successful. Miodufer (2015) as explores the idea of people having different skills sets and why this benefits the job market, especially people having different skill within the contemporary workplace which helps with the success of the digital industry. This enables demand for multiple jobs such as, designer, programmers, content creators and many more.

Another aspect of this project is the use of visual learning. Visual learning will allow the brain to make connections between colour and action therefore making the process of memorizing skills and knowledge easier as it'll be associated with colour subconsciously. Stokes (2008) found that using visual elements in both teaching and learning has been shown to give positive results, its also been shown that visuals can make learning entertaining which as agreed by Ott & Travella (2009) entertainment encourages motivation when it comes to learning. Also as studied by Wigfield & Cambria & Eccles (2012) their results showed that the more motivated students are the more effective learning is and therefore this results in more knowledgeable students and therefore a society. So, to summarise the use of visual learning makes learning more entertaining and therefore more effective. Stokes (2008) found that studies used an example called the mathematics approach where students "do" maths rather than watch maths, this technique emphasizes the importance of learning through interactive activities and suggests that learning by doing is more effective. Stokes (2008) also states that visual learning is only effective is the teachers have the tools and knowledge to fully utilize and implement it correctly into learning.

To concluding this literature review, its allow the project to see things from a new angle and has given ideas and inspiration as to what can be included to ensure the success of the project. Its highlighted different learning techniques such as the implementation of visual learning and gamification and the benefits of practical learning e.g. learning by doing, this will increase the motivation of the learning and therefore making the project more successful. The research has highlighted the importance of ensuring that the product creates a method of learning that is effective and the best ways to do this seems to make the product interactive. Integrating technology into music education offers numerous benefits for both students and educators. Technology makes music creation more accessible through virtual instruments and apps, spreading music education for those who might not have had the financial means for traditional lessons. As Gorbunova (2020) and Crawford (2013) highlight, technology fosters creativity and collaboration, and can boost motivation through community-based learning, a concept proven effective in various educational settings.

Moreover, technology's global reach allows students to access resources and expertise that were previously unavailable due to locational barriers, bridging educational gaps. Visual learning and gamification further enhance engagement and retention by making learning more

interactive and enjoyable. The use of visual cues, as Stokes (2008) points out, helps in understanding complex concepts, while gamification, as shown by Caponetto (2014), can increase motivation by rewarding progress.

Lastly, recognizing the diverse needs of learners, as Miodufer (2015) emphasizes, is key to creating personalized educational experiences. By leveraging technology, music education can be more inclusive, dynamic, and effective, offering students of all backgrounds a more engaging and impactful learning journey.

Methodology

My research question “How can we develop and produce a device that streamlines and simplifies the process of learning music theory?” aims to investigate the current market and methods in use for teaching music, I aim to create a method that is effective and profitable as a business to help more people develop their knowledge and passion for music and creating music and also reducing the number of people to give up the hobby due to frustration or slow/stalled progression. The overall aim is to make the experience of learning music theory as fun, interesting and effective for as many people as possible.

The simplest way to answer this question is to send out a survey to relevant people to establish if there is a big enough gap in the market to support my studies/idea as a profitable business. Another method would be to interview specifically musicians of all levels to find their experience with music theory and what tools they found effect and ineffective and why, finding out the reason behind potential competitors’ success or failure can be implemented into my research to help guide me and increase the chances of success.

My methods of primary research are appropriate because I’ll be making a product for the people targeted for questioning so its important that I understand what these people want and need from my design, as the same people will eventually be customers of mine. The project involves market research therefore its essential that I tailor my product to the market so I’m able to achieve sales. By collecting this data from a survey, it allows me to easily compile the results into statistics and graphs however the downside to this is that the data will be quantitative meaning that it’ll mainly be numbers or yes and no questions, therefore limiting the level of accuracy in the response. This is why I will also be conducting interviews; this is because it’ll help me gather qualitative data which is more language based and more specific and detailed. By having more detailed information from the responses it’ll allow me more knowledge and a greater understanding of how my question can be answer and the features needed on my final product to make it a success.

I plan to collect the data and display it in a simple method this is so that I can easily understand it and then use it to aid the development of my product. After I have my data from my surveys and other quantitative methods I plan to take the data into Excel, this is so I can create graphs and visual aides to help make the results easier to understand. I can also use this to compare the questionnaire results, which will benefit me because ill be able to have a clearer understanding of the why and how those answers were given. It’ll also help to give me a new perspective on the idea of the product, and it could help inspire a new design or method that’ll benefit me.

As for my qualitive data I’ll be comparing the answers to the questions and trying to spot any similarities or major differences. By spotting similarities it’ll provide a consensus, and I can gather a summarised answer to the question allowing me to develop the product using these

answers. I can also compare the differences, and this might help me see multiple stances on my project, it could give inspiration for new ideas leading to a product that can be tailored more specifically to the users' needs and wants.

My findings will have a great influence on my project, this is because the idea that I have now is only the first design. Meaning that the outcome of my research both primary and secondary will give new inspiration and opportunities to create, develop and implement into my idea creating multiple iterations which will then lead to and allow the comparison of different ideas and how they can be either combined or scrapped. Ultimately, I'm making a product for people henceforth the research and the opinions of those people will be highly important, by suiting the product to the customers' needs it'll allow me to create a better product that has a higher success rate as the product will be more consumer friendly.

Results / evaluation

The results of my survey were disappointing as I only got a handful of responses. To gain responses I posted my survey online to different Facebook groups and social forms, I also sent it out to friends and family, and I also printed QR codes and left them in various places around my university. Despite all of this I failed to gather the desired number of responses.

Next time if I were to send out surveys I'd send them directly to people instead for just general messages in group chats. By actually sending them directly to people I'd hope this would be more likely to gather useful responses and it would give me constructive criticism. I would also make a better more appealing poster; by making it more eye catching it would encourage more people to scan my QR code.

Discussion

I was unable to get my target audience to respond to my form as only 14.3% of people who replied to my form actually played a musical instrument. However, I did learn that including features such as having a gamification aspect to my project and teaching methods would be useful as 71.4% of people who answered my survey agreed this would be a good idea, and also the results from my secondary research would also indicate this to be true. Another positive response from my survey would be that people agreed that having colour association learning would also be a good idea which again is also in line with my secondary research.

I also found that people don't normally buy the premium versions of app, however this is useful to me, as calculated by the financial target the in-app subscription is a big part of my financial success therefore I must make the app appealing and make the premium features worthy of purchase from the customers point of view. The few responses to my questionnaire were also useful to get a sense for what people would be willing to pay for a product like this. The lowest amount was £10 which is unrealistic as I'd be selling my product at a huge loss, and the highest was £30. Both of these results were not what I hoped as I'd chosen to price my product at £40. I've estimated that the product might roughly cost £21 to manufacture and product so a profit margin of around 90% is asking a bit much so I could probably bring the RRP (Recommended Retail Price) down to make it more affordable for my customers.

Conclusion

In conclusion, this project explores the development of a device that simplifies the process of learning music theory, aligning with SDG 4 to provide equal opportunities in quality education. My research indicates a genuine need for innovative learning tools in music theory, driven by personal passion and thorough analysis of existing methods and market gaps. The approach combines primary and secondary research, including surveys and interviews, to understand the needs of different learner groups. Through qualitative and quantitative data, I aim to create a user-centric product that incorporates gamification and colour association to enhance learning engagement and effectiveness. Despite challenges in survey responses, the feedback gathered supports the integration of interactive and entertaining elements in educational tools. The financial aspect underscores the importance of pricing the product competitively while ensuring it remains accessible to a wider audience, addressing the economic divide in educational resources.

The ultimate goal is to foster a more engaging and effective learning experience for music theory, contributing to a broader effort in achieving educational equity. By continuously iterating on user feedback and market analysis, the project aims to deliver a product that not only educates but also inspires a love for music.

References

- Atkinson & Castro (2008)* Digital Quality of Life: Understanding the Personal and Social Benefits of the Information Technology Revolution. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1278185 [Accessed 26 November 2024]
- Brown (2012)* Experience Design and Interactive Software in Music Education Research. Available at: <https://core.ac.uk/download/pdf/143870831.pdf> [accessed 26 November]
- Caponetto (2014)* Gamification and Education: A Literature Review. Available at: <https://www.itd.cnr.it/download/gamificationECGBL2014.pdf> [accessed 27 November 2024]
- Crawford (2013)* Evolving technologies require educational policy change: Music education for the 21st century available at: <https://www.learntechlib.org/p/148105/> [accessed 24 November 2024]
- Deci & Vallerand & Pelletier & Ryan (1991)* Motivation and Education: The Self-Determination Perspective. Available at: https://sdtheory.s3.amazonaws.com/SDT/documents/1991_DeciVallerandPelletierRyan_EP.pdf [accessed 28 November 2024]
- Gorbunova (2020)* MUSIC COMPUTER TECHNOLOGIES AS AN INTEGRATIVE NETWORKING EDUCATIONAL ENVIRONMENT available at: https://www.researchgate.net/publication/368137791_MUSIC_COMPUTER_TECHNOLOGIES_AS_AN_INTEGRATIVE_NETWORKING_EDUCATIONAL_ENVIRONMENT [accessed 24 November 2024]
- Gorbunova (2020)* Mobile Technologies in the Process of TeachingMusicTheory available at : <https://revistas.usil.edu.pe/index.php/pyr/article/view/705/1052> [accessed 25 November 2024]

Gorbunova (2018) Proceedings of the International Conference Communicative Strategies of Information Society available at: <https://www.atlantis-press.com/proceedings/csis-18/55913802> [accessed 27 November 2024]

Kämpfen (2018) Does education help “old dogs” learn “new tricks”? The lasting impact of early-life education on technology use among older adults. Available at: <https://www.sciencedirect.com/science/article/pii/S0048733318300787#bibl0005> [accessed 26 November 2024]

Nizam, Zaharul, Saidon (2019) Designing Online Interactive Application of Learning Music Theory in Blended Learning Mode available at: <https://www.ijrte.org/wp-content/uploads/papers/v7i6s2/F10340476S219.pdf> [accessed 27 November]

Okayama (2011) Does community-based education increase students’ motivation to practice community health care? - a cross sectional study Available at: <https://link.springer.com/content/pdf/10.1186/1472-6920-11-19.pdf> [Accessed 26 November 2024]

Stokes (2008) Visual Literacy in Teaching and Learning: A Literature Perspective. Available at: <https://xhspz.wordpress.com/2008/07/25/visual-literacy-in-teaching-and-learning/> [accessed 26 November 2024]

Wigfield & Cambria & Eccles (2012) motivation in education. Available at: <https://nibmehub.com/opac-service/pdf/read/The%20Oxford%20Handbook%20of%20Human%20Motivation.pdf#page=482> [Accessed 27 November 2024]

Appendix

Sales Targets		months						Years	
EZ Harmony									
categories		month 1	month 2	month 3	month 4	month 5	month 6	year 1	year 2
revenue		£889.90	£1,779.80	£3,114.65	£5,339.40	£6,674.25	£8,899.00	£44,495.00	£98,990.00
cost of product per 1 unit		£21.46	£21.46	£21.46	£21.46	£21.46	£21.46	£21.46	£21.46
sales price		£40.00	£40.00	£40.00	£40.00	£40.00	£40.00	£40.00	£40.00
number of sales		20	40	70	120	150	200	1000	2250
subscriptions sales price monthly		£8.99	£8.99	£8.99	£8.99	£8.99	£8.99	£8.99	£8.99
subscriptions		10	20	35	60	75	100	500	1000
subscriptions income		£89.90	£179.80	£314.65	£539.40	£674.25	£899.00	£26,970.00	£107,880.00
gross profit		£460.78	£921.56	£1,612.73	£2,764.68	£3,455.85	£4,607.80	£45,514.00	£149,604.00
expenses									
marketing and promotion costs		£250.00	£300.00	£360.00	£432.00	£518.40	£622.08	£2,363.90	£8,982.84
overheads		20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
research and development		£4,939.89	£175.00	£175.00	£175.00	£175.00	£175.00	£175.00	£175.00
App management		£150.00	£150.00	£150.00	£150.00	£150.00	£150.00	£150.00	£150.00
total expenses		£5,369.89	£655.00	£715.00	£787.00	£873.40	£977.08	£3,226.68	£11,169.40
profit earnings before tax		£460.78	£921.56	£1,612.73	£2,764.68	£3,455.85	£4,607.80	£45,514.00	£149,604.00
profit after taxes on sales		£373.23	£746.46	£1,306.31	£2,239.39	£2,799.24	£3,705.85	£34,135.50	£112,203.00
overall profit		£4,996.66	£91.46	£591.31	£1,452.39	£1,925.84	£2,728.77	£30,908.82	£101,033.60

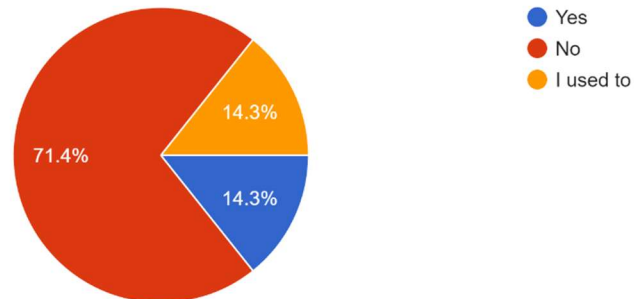
category	costs	explanation
initial investment	£0.00	no current investors
product development	£0.00	self-developed I will learn skills myself
app development	£3,576.00	hire an external developer
hardware	£596.89	cost of having a pcb printed and checked
software	£0.00	currently under student license so free
additional costs		
advertising	£250.00	advertising budget
domain	£12.00	cost of webpage
social media		
maintenance	£0.00	self-maintained to start
trademark	£170.00	
patent	£310.00	
branding	£0.00	self-managed to start
amazon fee	£25.00	amazons monthly selling fee
total start up cost first month		£4,939.89

recurring monthly costs	cost	explanation
advertising	£250.00	250 per month with a 20% increase in budget each month
amazon fee	£25.00	
app maintenance	£150.00	
total additional cost per month		£275.00

cost of production category per 100 units		
units	cost	explanation
		cost of producing 100 units
pcb	£174.00	roughly
led element	£750.00	per 100 units/ includes 126 LEDs
packaging	£14.00	£0.14 per unit
housing	£350.00	£3.50 per unit
components	£500.00	£5 per unit
overheads	20.00%	20% is standard
total cost per unit		£21.46

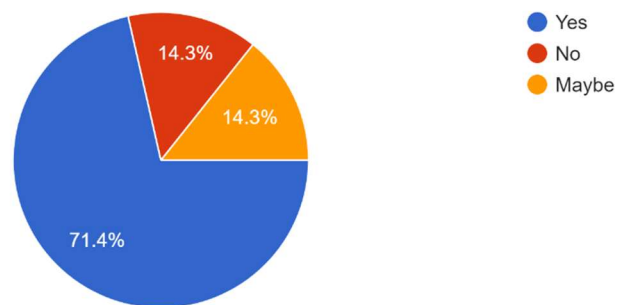
do you currently play a musical instrument

7 responses



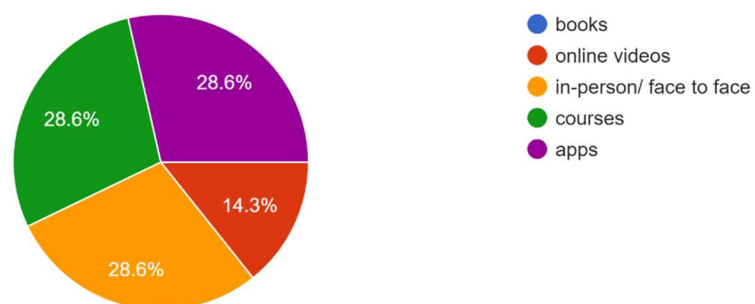
does gamification factor into your engagement when it comes to learning?

7 responses



how do you currently learn best?

7 responses



how often do you pay for premium versions of apps?

7 responses

